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# **Notice of Allowability**

Application No.

09/535,241

Examiner

Tiffany A Fetzner

Applicant(s)

TSUDA, MUNETAKA

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**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 04/19/2004.
2. ☒ The allowed claim(s) is/are 14-35.
3. ☐ The drawings filed on \_\_\_\_\_ are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☒ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☒ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☒ hereto or 2) ☐ to Paper No./Mail Date 07/09/2004.
    - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 07/09/2004.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## **Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 07/09/2004.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

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### **Examiner's Amendment**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

2. Authorization for this examiner's amendment was given in a telephone interview with Associate **Attorney Paul Teng Reg. No. 40, 837** on July 9<sup>th</sup> 2004 along with authorization to charge any necessary fees to applicant's deposit account.

3. The application has been amended as follows:

**A) Replace claim 14 with the following Examiner amended claim 14:**

**Claim 14** --- A magnetic resonance imaging apparatus comprising:

- a static magnetic field generating unit that generates a homogeneous static magnetic field in an inspection space;

- a gradient magnetic field generating unit that generates a magnetic field strength gradient;

- a high frequency magnetic field generating unit;

- a detecting unit that detects nuclear magnetic resonance signals generated from an object to be examined;

- a display unit that displays an image as a result based on the detection;

- a temperature detecting unit that detects a temperature of said static magnetic field generating unit and/or the local surroundings thereof;

- a magnetic field correcting unit that receives a current from a power source and generates an additional magnetic field that corrects local non-uniformity of the distribution of said static magnetic field within said inspection space being caused by temperature change of said static magnetic field generating unit and/or the local surrounding space of it; and

- a control unit that controls said magnetic field correcting unit based on the temperature detected by said temperature detecting unit,

wherein a spatial distribution of said additional magnetic field is adjusted by said magnetic field correcting unit under control of said control unit, when the current is supplied by the power source to said magnetic field correcting unit, based on the temperature detected by said temperature detecting unit of said static magnetic field generating unit and/or the local surroundings thereof. ---

**B) Replace claim 21 with the following Examiner amended claim 21:**

**Claim 21** --- A method for maintaining uniformity of a static magnetic field generated by a static magnetic field generating unit in a magnetic resonance imaging apparatus,

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by generating an additional magnetic field when said apparatus receives a current from a power source, the method comprising the steps of:

- calculating a temperature dependence of the local non-uniformity of distribution of the static magnetic field in an inspection space provided for an object to be examined, said local non-uniformity of distribution of the static magnetic field being caused by temperature change of the static magnetic field generating unit and/or the local surroundings thereof; and

- detecting a temperature of the static magnetic field generating unit and/or the local surroundings thereof; and

- generating the additional magnetic field having a magnetic field distribution that corrects said local non-uniformity of the distribution of the static magnetic field within said inspection space,

- wherein the spatial distribution of the additional magnetic field is adjusted when the current is supplied by the power source to said apparatus, based on the detected temperature of said static magnetic field generating unit and/or the local surroundings thereof. ---

**C) Replace claim 22 with the following Examiner amended claim 22:**

**Claim 22** --- A magnetic resonance imaging apparatus comprising:

- a static magnetic field generating means that generates a homogeneous static magnetic field in an inspection space; and

- a uniformity correcting means that receives a current from a power source, detects temperature change affecting uniformity of the distribution of the static magnetic field generated by the static magnetic field generating means, and generates an additional static magnetic field that cancels local non-uniformity of the distribution of the static magnetic field within said inspection space based on the detected temperature change,

- wherein a spatial distribution of said additional static magnetic field is adjusted by said uniformity correcting means when the current is supplied by the power source to said uniformity correcting means, based on the temperature change detected by said uniformity correcting means. ---

**D) Replace claim 23 with the following Examiner amended claim 23:**

**Claim 23** --- A magnetic resonance imaging apparatus comprising:

- a static magnetic field generating unit that generates a static magnetic field of a predetermined intensity, said static magnetic field generating unit comprising a pair of super conducting coils and a pair of cryostats each accommodating one of said pair of super conducting coils;

- a supporting means that supports said pair of cryostats as being apart so as to form an inspection space for an object to be examined;

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a gradient magnetic field generating unit that generates a magnetic field having an intensity gradient;

means that generates a high frequency magnetic field;

means that detects nuclear magnetic resonance signals generated from said object;

means that processes said nuclear magnetic resonance signals and that displays the processed results;

a temperature detecting unit that detects a temperature of said static magnetic field generating unit, said support means and/or the local surrounding space thereof;

a magnetic field correcting unit that receives a current from a power source and generates an additional magnetic field that corrects the local non-uniformity of the distribution of said static magnetic field within said inspection space being caused by temperature change of said static magnetic field generating unit, said support means and/or the local surrounding space thereof; and

a control unit that controls said magnetic field correction unit based on the temperature detected by said temperature detecting unit,

wherein a spatial distribution of said additional magnetic field is adjusted by said magnetic field correcting unit under control of said control unit, when the current is supplied by the power source to said magnetic field correcting unit, based on the temperature detected by said temperature detecting unit of said static magnetic field generating unit, said support means and/or the local surrounding space thereof. ---

**E) Replace claim 30 with the following Examiner amended claim 30:**

**Claim 30** ---A magnetic resonance imaging apparatus comprising;

a static magnetic field generating unit that generates a static magnetic field of a predetermined intensity, said static magnetic field generating unit including a pair of super conducting coils;

a supporting means that supports said pair of super conducting coils as being apart so as to form an inspection space for an object to be examined;

a gradient magnetic field generating means that generates a magnetic field having an intensity gradient;

means that generates a high frequency magnetic field;

means that detects nuclear magnetic resonance signals generated from said object;

means that processes said nuclear magnetic resonance signals and that displays the processed results;

a temperature detecting unit that detects a temperature of said support means;

a magnetic field correcting unit that receives a current from a power source and generates an additional magnetic field which corrects the local non-uniformity of the distribution of said static magnetic field within said inspection space being caused by deformation of said supporting means due to the temperature change thereof; and

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a control unit that controls said magnetic field correction unit based on the temperature detected by said temperature detecting unit,  
wherein a spatial distribution of said additional magnetic field is adjusted by said magnetic field correcting unit under control of said control unit, when the current is supplied by the power source to said magnetic field correcting based on the temperature detected by said temperature detecting unit of said support means. ---

**F) Replace claim 31 with the following Examiner amended claim 31:**

**Claim 31** --- A magnetic resonance imaging apparatus according to any one of claims 14, 23 and 30, wherein said apparatus further comprises:  
means that calculates a temperature dependence of a local non-uniformity of distribution of the static magnetic field in the inspection space, said local non-uniformity distribution of the static magnetic field being caused by temperature change of the static magnetic field generating unit and/or the local surrounding space thereof;  
means that holds a control data that corrects the local non-uniformity of the distribution of the static magnetic field corresponding to the temperature; and  
means that outputs the control data being selected from said control data holding means based on the detected temperature into said control unit. ---

**G) Replace claim 32 with the following Examiner amended claim 32:**

**Claim 32** --- A magnetic resonance imaging apparatus according to **claim 23**, further comprising:  
a connection pipe which connects the pair of cryostats,  
wherein said temperature detecting unit also detects a temperature of the connection pipe and  
said control unit controls the magnetic field correcting unit based also on the temperature of the connection pipe. ---

**H) Replace claim 34 with the following Examiner amended claim 34:**

**Claim 34** --- A magnetic resonance imaging apparatus according to **claim 33**, wherein said control unit:  
finds and adds the correction value of a static magnetic field non-uniformity component caused by the temperature of the supporting means and the correction value of a static magnetic field non-uniformity component caused by the temperature difference between the supporting means and the connection pipe, and  
controls the magnetic field correcting unit based on the sum of the correction values. ---

**I) Replace claim 35 with the following Examiner amended claim 35:**

**Claim 35** --- A magnetic resonance imaging apparatus comprising:

- a static magnetic field generating unit that generates a static magnetic field of a predetermined intensity in an inspection space, said static magnetic field generating unit comprising a pair of permanent magnets;

- a supporting means that supports said pair of permanent magnets as being apart so as to form an inspection space for an object to be examined;

- a gradient magnetic field generating unit that generates a magnetic field having an intensity gradient;

- means that generates a high frequency magnetic field;

- means that detects nuclear magnetic resonance signals generated from said object;

- means that processes said nuclear magnetic resonance signals and that displays the processed results;

- a temperature detecting unit that detects a temperature of at least one of said static magnetic field generating unit, support means and the local surrounding space of them;

- a magnetic field correcting unit that receives a current from a power source and generates an additional magnetic field that corrects the local non-uniformity of the distribution of said static magnetic field within said inspection space being caused by temperature change of said static magnetic field generating unit, said support means and/or said local surrounding space of them; and

- a control unit that controls said magnetic field correction unit based on the temperature detected by said temperature detecting unit,

- wherein a spatial distribution of said additional magnetic field is adjusted by said magnetic field correcting unit under control of said control unit, when the current is supplied by the power source to said magnetic field correcting unit, based on the temperature detected by said temperature detecting unit of said at least one of said static magnetic field generating unit, support means, and/or the local surrounding space of them. ---

The following is an examiner's statement of **Reasons for Allowance**:

4. With respect to Examiner amended claims **14, 21, 22, 23, 30, 31, 32, 34, 35, and previously presented claims 15-20, 24-29, and 33**, these claims are allowable over the prior art of record because the prior art of record does not disclose or suggest an MRI apparatus, or method, which comprises "a uniformity correcting means that receives a current from a power source, detects temperature change affecting the uniformity of the distribution of the static magnetic field generated by the static magnetic field generating means and generates an additional static magnetic field that cancels local non-uniformity of the distribution of the static magnetic field within said inspection

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space based on the detected temperature change, wherein a spatial distribution of said additional static magnetic field is adjusted by said uniformity correcting means when the current is supplied by the power source to said uniformity correcting means, based on the temperature change detected by said uniformity correcting means", **in combination with the remaining limitations of each of the allowed claims, in combination with the remaining limitations of each of the claims.** It is the combination of the claim limitations taken as a whole that constitutes both the novelty and non-obviousness of applicant's claims.

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

#### Examiner's Comment

6. The Examiner notes that **Watkins et al.**, US patent 6,252,405 B1 filed November 15<sup>th</sup> 1999 is **not available as prior art** because applicant's instant application has a Japanese priority date of March 26<sup>th</sup> 1999, and has supplied the certified English translation(s) of the Japanese priority documents.

7. The Examiner also agrees with applicant's arguments filed April 19<sup>th</sup> 2004 concerning U.S. Patent No. 4,663,592 to **Yamaguchi et al.**, and U.K. Patent Application Publication No. GB 2219 406 A to **Warner**. [See the April 19<sup>th</sup> 2004 remarks on pages 14-16 of the April 19<sup>th</sup> 2004 amendment response.]

8. The examiner amendments to the claims are supported by applicant's original disclosure and the certified English translation of Japanese priority document 11-83744 filed March 26<sup>th</sup> 1999.

#### Drawings

9. A New set of corrected drawings are required in this application because the official draftsman has objected to the drawings submitted **September 29<sup>th</sup> 2003** and **April 19<sup>th</sup> 2004**. A **complete set of NEW FORMAL DRAWINGS** including any and all examiner approved drawing changes, that have occurred during this examination are now required. [See the attached PTO 948 form of the Official Draftsman's Review.]

10. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

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### Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF  
July, 7<sup>th</sup> 2004



Diego Gutierrez  
Supervisory Patent Examiner  
Technology Center 2800